Conclusions: These results show that illness perceptions are associated with disability cross-sectionally and also after short-term follow-up. Dimensions of illness perceptions that are of importance cross-sectionally are not the same as those that are associated with disability longitudinally. These results may imply that biopsychosocial interventions aiming at changing negative illness perceptions can contribute to better functional, psychological and social outcome. As such interventions produce positive effects on important outcome measures in patients with various chronic illnesses, psychological interventions in patients with hand OA are urgently called for.

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THE ASSOCIATION BETWEEN MUSCLE WEAKNESS AND ACTIVITY LIMITATIONS IN PATIENTS WITH EHLERS DANLOS (HYPERMOBILITY TYPE): THE IMPACT OF PROPRIOCEPTION

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Purpose: Patients diagnosed with Ehlers Danlos Syndrome Hypermobility Type (EDS-HT) are characterized by connective tissue laxity which is associated with chronic pain, fatigue, muscle weakness and potentially leading to activity limitations. When developing effective treatment for patients with EDS-HT it is essential to know which factors are associated with activity limitations. In EDS-HT, a direct relationship between muscle strength and activity limitations has never been studied in detail. The association between limitations in activities and muscle strength might be moderated by other biomechanical factors, like proprioception. Recent studies have established that proprioception is reduced in patients with EDS-HT still no studies are available at this time which have investigated the impact of proprioception on the association between muscle strength and activity limitations in patients with EDS-HT. Therefore, the objective of the study was to establish the association between muscle strength and activity limitations and the impact of proprioception of the knee joint on this association in patients with EDS-HT.
Methods: 25 subjects with EDS-HT were compared with 24 healthy controls. Activity limitations, both performance and capacity qualifiers, were quantified according to the Health Assessment Questionnaire (HAQ), the Six-Minute Walk test (6MWT) and the 30-second chair-rise test (30CRT). Muscle weakness was measured by handheld dynamometry (normalised over fat-free mass) and (knee) proprioception was measured by movement detection paradigm. Pain was measured-with an Visual Analogue Scale, fatigue by the Checklist Individual Strength and subject demographics (age, BMI, disease duration) were questioned. Statistical analyses were performed in three stages. First, descriptions of the subjects and the measures of central tendency were calculated. All outcomes were transformed into z-scores in order to aid in meaningful interpretability. Healthy controls were used within statistical analyses as a contrast group in terms of disease severity as to the divergence from normality. Secondly, differences between groups were determined by independent Student t-test. Thirdly, the association between dependent and independent variables were performed, in order to determine the inter-variable relationship and to identify potential confounding factors. All significant factors were retained for multivariate analyses. In the final stage, the association of muscle strength with activity limitations was established, controlled for the moderation by proprioception, pain and fatigue and other potential confounders (age, BMI, disease duration). For each outcome of activity limitations, a two level (subjects and controls) mixed linear model was constructed in which activity limitations was the dependent variable and muscle strength and proprioception independent variables. This association was adjusted for the potential confounders: age, BMI, disease duration. In the adjusted model all independent variables were entered and consecutively a backward selection was applied in order to establish the final model. The independent factors were retained by default, whereas confounders and interaction effects were retained in the final model when a p-value of $<.200$ was present and the deletion of a variable resulted in a reduction of the Tsai-Hutch Criterion (AICC: Goodness of Fit). Results of the mixed linear models were presented in regression coefficients and corresponding standard errors (B(SE)) with 95% confidence intervals (95%CI).
Results: Subjects with EDS-HT showed a higher degree of activity limitations, more pain and fatigue, muscle weakness and proprioceptive inaccuracy compared to the healthy controls ($p < 0.05$). Muscle weakness was correlated with lower scores on the 30CRT ($r = .669$, $p < .0001$), the 6MWT ($r = .577$, $p = <.0001$) and higher scores on the HAQ ($r = .626$, $p = <.0001$). Proprioceptive inaccuracy was associated with lower scores on the 30CRT ($r = .552$, $p < .0001$), the 6MWT ($r = .400$, $p = .001$) and higher scores on the HAQ ($r = .456$, $p = .001$). Muscle weakness was found to be the largest contributor to the variance in activity limitations. Proprioceptive inaccuracy, pain and fatigue had an impact on the association between muscle strength and activity limitations ($p < .05$).
Conclusion: Muscle weakness was associated with an increase in activity limitations in subjects with EDS-HT. This association was moderated by joint proprioception, and should be recognised as an important factor when developing new treatment modalities which aim to reduce activity limitations.

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CONTENT AND EVALUATION OF THE BEEP TRIAL (BENEFITS OF EFFECTIVE EXERCISE FOR KNEE PAIN) PHYSICAL THERAPIST TRAINING PROGRAMME: DID IT CHANGE CLINICAL PRACTICE?

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Purpose: Clinical guidelines consistently recommend exercise as a core treatment for patients with knee osteoarthritis (OA). Physical therapists are well placed to deliver exercise programmes for this population, yet we have previously shown that their current practice is suboptimal. This study aimed to explore whether participating in a training programme and delivering an exercise intervention as part of the BEEP trial (Benefits of Effective Exercise for chronic knee Pain) (ISRCTN93634563) results in changes in physical therapists' clinical behaviour for patients with knee OA.
Methods: 53 physical therapists from 11 NHS clinics in the West Midlands (UK) were trained to deliver one of three exercise-based interventions within the BEEP trial: 'usual physical therapy care', 'individually tailored exercise', and 'targeted exercise adherence'. The training programme was stepped in that all physical therapists attended the first day and received an update of the evidence base for exercise and knee OA, based on the National Institute for Health and Care Excellence (NICE) OA guidelines. Days two and three, attended by physical therapists delivering 'individually tailored exercise' and 'targeted exercise adherence', focused on why and how to individualise, progress and supervise lower limb exercise. Days four and five were only attended by physical therapists delivering 'targeted exercise adherence' and focused on the importance of exercise adherence, the physical therapist's role in facilitating behaviour change, and sustaining long-term physical activity. The training programme included lectures, workshops, role play, group discussion and case studies, with homework set to consolidate learning. In order to evaluate the BEEP trial training programme all physical therapists were asked to complete a questionnaire before (pre-training), immediately afterwards (post-training), and after delivering the BEEP trial exercise intervention (post-intervention, approximately 12–18 months after the training). The questionnaire included a vignette describing a 'typical' patient with knee OA and associated clinical management questions, including their use of exercise for the vignette case.
Results: Nearly all physical therapists returned the pre-training questionnaire ($n = 52$), 44 (85%) and 39 (74%) returned the post-training and post-intervention questionnaires respectively. The majority were female (63%), and treated at least one patient with knee OA per week (62%). Pre-training, all physical therapists reported that they would provide advice and exercise for the vignette case, but often alongside other interventions, including manual therapy (29%), acupuncture (15%), and electrotherapy (12%). Exercise focused on local knee muscle strengthening (100%), and flexibility/ range of movement exercise (92%) as opposed to formal aerobic training (17%). During follow-up appointments, 78% of physical therapists reported that they would supervise exercise, and 60% would provide written advice on home exercises. Nearly all reported that they would monitor exercise adherence, but only 6% would use an exercise diary. Post-training, fewer

physical therapists reported that they would use other interventions in addition to advice and exercise (manual therapy 27%, acupuncture 5%, electrotherapy 2%) and there was an increased focus on aerobic training (37%). More physical therapists reported that they would supervise exercise (95%) and provide written advice about home exercise (75%) during follow-up appointments, and more would use an exercise diary to monitor exercise adherence (43%). Changes appeared most pronounced in those physical therapists attending the training days supporting 'targeted exercise adherence' and 'individually tailored exercise' interventions. Some of the reported changes were maintained at the post-intervention evaluation, including lower reported rates of other treatments, greater supervision of exercise during follow-up (89%) and use of exercise diaries (49%). However, use of specific aerobic training had reverted to pre-training levels (15%), as had use of written exercise advice during follow-up appointments (69%).

Conclusion: Overall, participating in a dedicated training programme as part of a randomised trial changed some aspects of how physical therapists manage patients with knee OA. This suggests that attending training programmes, particularly those that are highly focused, are useful in terms of changing clinical practice, but multi-faceted approaches are likely to be needed to successfully maintain changes in clinical behaviour over time.

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GETTING A GRIP ON ARTHRITIS: WEB-BASED CONTINUING HEALTH EDUCATION IMPROVES RURAL/REMOTE PRIMARY HEALTH CARE PROVIDERS' SATISFACTION AND CONFIDENCE WITH MANAGING OSTEOARTHRITIS

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Purpose: Osteoarthritis (OA) is highly prevalent in Canada's rural/remote communities. Primary health care providers serving these communities are often challenged with delivering optimal OA care and accessing relevant up-to-date information. *Getting a Grip on Arthritis,* a web-based continuing health education module with case-based content developed around best practice guidelines, was recently developed to address these issues. An evaluation of the program's effectiveness in improving primary health care providers' confidence and satisfaction with their ability to manage OA was performed.

Methods: An online learning module was developed for OA based on a needs assessment with primary health care providers, and input from an interdisciplinary expert panel. The module was piloted in two predominantly rural/remote areas of Canada with documented arthritis prevalence and health human resource shortages. These areas encompassed the North West Local Health Integration Network in Ontario and the Central Health Region in Newfoundland. A mixed methods evaluation was performed. This included 1) paired samples analyses of pre/post measurements of confidence and satisfaction with ability to manage arthritis and 2) an evaluation of module content and design. Confidence and satisfaction were measured on 10 point numerical rating scales (0 = not satisfied/not at all confident; 10 = extremely satisfied/confident).

Results: Thirty-four providers participated in the pilot, which exceeded our target of 30. Participants represented various primary health care professions, including physiotherapists, occupational therapists, nurses, and family physicians. After taking the module, satisfaction with ability to manage OA improved significantly ($p = 0.02$). Significant increases in confidence with different aspects of OA care were also observed. Participants' confidence also improved for the comprehensive musculoskeletal examination ($p = 0.02$), prescribing/recommending corticosteroids ($p = 0.02$), ordering/recommending serological tests ($p \leq 0.01$), and managing common musculoskeletal conditions ($p = 0.03$). The majority of respondents agreed that the module was consistent with stated objectives (97.5%), addressed their learning needs (87.2%) and was relevant to practice (80.0%). The planned use of relevant resources in practice and with patients highlighted the participants' commitment to change. Participant feedback highlighted the need for additional information relevant to professions other than physicians to better capture the importance of inter-professional care.

Conclusions: With knowledge gained from the online module, participants reported an increase in both satisfaction and confidence with managing OA. The module was also relevant to practice and the content addressed the participants' learning needs. The case-based format simulated interaction with 'real' patients and enabled participants to practice their diagnostic and management skills. Feedback is being incorporated into the final version of the module with plans for a national launch in 2014.

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THE RELATIVE CONTRIBUTION OF MECHANICAL STRESS AND SYSTEMIC PROCESSES IN DIFFERENT TYPES OF OSTEOARTHRITIS: THE NEO STUDY

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Purpose: Obesity is a risk factor for osteoarthritis (OA) in both weight-bearing and non-weight-bearing joints. In the association between obesity and OA, both increased mechanical stress and systemic processes seem to be of importance, although it is unclear which mechanisms play a role in certain joints. To gain more insight into the relative contribution of mechanical stress and systemic processes to OA of weight-bearing and non-weight-bearing joints, we examined the association of surrogates for both mechanisms with OA of the knees, hands or both.

Methods: The Netherlands Epidemiology of Obesity (NEO) study is a population-based cohort including 6673 lean, overweight and obese participants aged 45–65 years. Weight (kg) and fat mass (kg) were measured, fat free mass (FFM) (kg) was calculated. The metabolic syndrome (MetS) was defined following the ATPIII criteria; based on measured waist circumference (cm), blood pressure (mmHg), triglycerides (mmol/L), HDL cholesterol (mmol/L), fasting glucose (mmol/L), and recorded medication use. Knee and hand OA were defined according to the ACR clinical criteria; pain and stiffness were measured using a standardized questionnaire, physical examination of the knees and hands was performed by trained research nurses. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to associate surrogates for mechanical stress (weight, FFM) and systemic processes (MetS) with OA in knees alone, both knees and hands or hands alone, using individuals without knee or hand OA as reference group. Analyses were adjusted for age, sex, height, smoking, education and ethnicity, and either metabolic factors or weight. Finally, adjusted ORs were calculated for each OA type in three weight categories (<75 kg, 75–90 kg, >90 kg), stratified by MetS. Participants in the lowest weight category without MetS served as reference.

Results: After exclusion of participants with missing data (n = 45), data from 6628 participants were analyzed (median (IQR) age 56 years (50–61), BMI 26 kg/m^2 (23–28), 56% women). The estimated population prevalence of knee, both knee and hand, and hand OA were 10%, 4% and 8%, respectively. After adjustment for metabolic factors, knee OA was associated with both weight (OR 1.49 (95%CI 1.32,1.68)) and FFM (OR 2.05 (1.60,2.62)). Similar results were observed for OA in both knees and hands (OR 1.51 (95%CI 1.29,1.78) and 2.17 (1.52,3.10) respectively). Neither knee OA nor OA in both knees and hands were associated with MetS after adjustment for weight (OR 1.08 (95%CI 0.85,1.39) and (1.03 (0.72,1.46) respectively). In hand OA the opposite was observed; whereas no associations with weight and FFM were observed after adjustment for metabolic factors (OR 1.12 (95%CI 0.96,1.32) and 1.17 (0.83,1.63) respectively), hand OA remained associated with MetS, after adjustment for weight (OR 1.46 (95% CI 1.06,2.02)). The figure illustrates the relative contribution of weight as surrogate for mechanical stress and MetS as surrogate for systemic processes to OA of the knees (a) and hands (b). The adjusted ORs for knee OA were higher in higher categories of weight as compared with the lowest weight category. The adjusted OR of the highest weight category in individuals without MetS was 2.62 (95%CI 1.77,3.88) (Figure). The adjusted OR of highest versus lowest weight category in individuals with MetS was 2.30 (1.29,4.12). The presence of MetS, adjusted for the weight categories, did not result in a higher OR for knee OA (1.16 (95%CI 0.91,1.47)) (Figure). The same